The STOP Sepsis Bundle Toolkit

Strategies to Timely Obviate the Progression of Sepsis in the Emergency Department

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Table of Contents

INTRODUCTION

What is a bundle?

A bundle is a group of interventions related to a disease that when performed together result in better outcome than when individually done. It increases the use of evidence-based science in clinical practice and provides a mechanism to enforce teamwork. A bundle is not guidelines, but a method to implement the guidelines. In creating a bundle, several rules have to be met: 1) the components of the bundle are solid and accepted into clinical practice, 2) the components must be completed in the same space and time interval, 3) the completion of each component can be answered by a "Yes" or "No", 4) the delivery of the whole bundle can be answered by a "Yes" or "No", and 5) the function of the bundle or the disease process it targets needs to be frequently occurring[1].

What is the STOP Sepsis Bundle?

The STOP Sepsis Bundle is an implementation of an early sepsis treatment model specific to the emergency department at Loma Linda University. It focuses on the first 6 hours of care after severe sepsis or septic shock is recognized. While it was designed for the emergency department setting, the bundle can be applied in any location where care is being given to patients with severe sepsis or septic shock; e.g. the medical ward, the recovery room, or the intensive care unit.

What is the evidence and support for the STOP Sepsis Bundle?

The Surviving Sepsis Campaign guidelines for the management of severe sepsis and septic shock[2] serve as framework for the bundle. The advances in therapy behind the bundle are early goal-directed therapy (EGDT)[3], corticosteroids[4], and activated protein C[5]. Most important in the first 6 hours of therapy for severe sepsis or septic shock is the implementation of EGDT as originally presented by Rivers et al[3]. The STOP Sepsis Bundle was not conceived to replace or modify EGDT, but is presented as an adaptation of the original EGDT research, and with the hope of making EGDT as widely implemented as possible. This suggested bundle is also an adaptation of the sepsis bundle provided by the Institute for Health Care Improvement[1] to the clinical environment at our institution. We are indebted to Dr. Emanuel P. Rivers for his visionary research into EGDT and for his tireless leadership in promoting optimal care for patients during the earliest phases of severe sepsis and septic shock.

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The STOP Sepsis Bundle

Strategies to Timely Obviate the Progression of Sepsis **– Loma Linda University**

Early Recognition

Two or more of the following:
1) Temp > 38.3C(100.9F) or < 36.0C(96.8F)
2) Heart Rate > 90
3) Resp Rate > 20 or $PaCO_2$ < 32 mmHg
4) WBC > 12K, < 4K or > 10% Bands

NO → Re-Assess

YES → Suspected Infection

NO → Re-Assess

YES → Obtain Appropriate Cultures; Check Lactate

SBP < 90 after Bolus — NO → Lactate ≥ 4 mmol/L or ≥1 Organ Dysfunction — NO → Sepsis → Antibiotics and Re-Assess

SBP < 90 after Bolus — YES → Septic Shock

Lactate ≥ 4 mmol/L or ≥1 Organ Dysfunction — YES → Severe Sepsis

Septic Shock; Severe Sepsis → **Early Goal Directed Therapy**

Initiate Sepsis Orders

Central Line Placement for CVP/$ScvO_2$ Monitoring

Initiate Broad Spectrum Antibiotics

Supplemental Oxygen OR Mechanical Ventilation with Lung Protective Strategies

CVP

CVP < 8 → 1. NS 500 mL Bolus until CVP 8-12, then Continue at 150 mL/hr; 2. Consider Adding Colloid if CVP < 4

CVP > 15 and SBP > 160 (MAP > 110) → Nitroglycerin 10-60 mcg/min until CVP < 12 or SBP < 140 (MAP < 90)

CVP 8-12 →

SBP/MAP

SBP < 90 (MAP < 65) → 1. Arterial Line Placement (preferred); 2. Norepinephrine 2-20 mcg/min; 3. Dopamine 5-20 mcg/kg/min; 4. Phenylephrine 40-200 mcg/min (if HR > 120); 5. Vasopressin 0.01-0.04 U/min (if on another Vasopressor); 6. Epinephrine 2-10 mcg/min; 7. Dexamethasone 2 mg IV q 6 hrs OR Hydrocortisone 50 mg IV q 6 hrs after CST (if on Vasopressor or Adrenal Insufficiency)

SBP > 160 (MAP > 110) → 1. Nitroglycerin 10-60 mcg/min; 2. Hydralazine 10-40 mg IV

SBP 90-140 (MAP 65-90) →

$ScvO_2$

$ScvO_2$ < 70 → **Hgb**

Hgb < 10 → Transfuse 1-2 unit PRBC → 1. Arterial Line Placement (preferred); 2. Dobutamine 2.5-20 mcg/kg/min (if HR < 100 and SBP > 100); 3. Dopamine 5-10 mcg/kg/min

Hgb ≥ 10 → 1. Arterial Line Placement (preferred); 2. Dobutamine 2.5-20 mcg/kg/min (if HR < 100 and SBP > 100); 3. Dopamine 5-10 mcg/kg/min

$ScvO_2$ ≥ 70 → Intubation and Mechanical Ventilation with Lung Protective Strategies

Heart Rate

HR > 120 → Consider Digoxin 0.25 –0.5 mg IV

HR ≤ 120 →

Goals Achieved

Lactate > 2 → Re-check Lactate

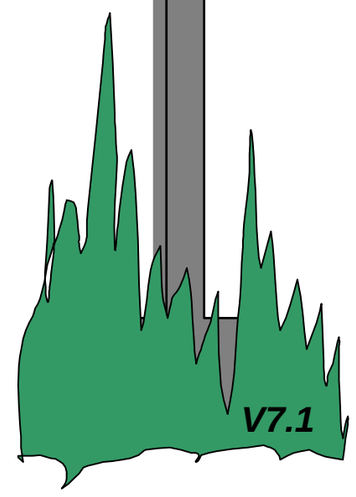
YES →

APACHE II ≥ 25

YES → Consider Drotrecogin alfa activated 24 mcg/kg/hr x 96 hr

NO → **The Golden 6 Hours of Early Intervention**

STOP Sepsis



The 6-Hour STOP Sepsis Bundle for Severe Sepsis or Septic Shock

1. Initiate CVP/$ScvO_2$ Monitoring within 2 hours
2. Give Broad Spectrum Antibiotics within 4 hours
3. Achieve Hemodynamic Goals within 6 hours
   a) CVP ≥ 8 mmHg
   b) MAP ≥ 65 mmHg / SBP ≥ 90 mmHg
   c) $ScvO_2$ ≥ 70%
4. Monitor for Decreasing Lactate
5. Give Steroid if on Vasopressor or suspect Adrenal Insufficiency

Disclaimer

The STOP Sepsis Bundle is a clinical template.
Clinician should use judgment for individual patient encounters.

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A CLINICAL OUTLINE FOR EMERGENCY DEPARTMENT CARE OF PATIENTS WITH SEVERE SEPSIS AND SEPTIC SHOCK

for the STOP Sepsis Bundle: Strategies to Timely Obviate the Progression of Sepsis

Version 7.1

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SEPSIS DEFINITIONS[1, 2]:

Infection: A microbial phenomenon characterized by an inflammatory response to the presence of microorganisms or the invasion of normally sterile host tissue by those organisms.

Signs of Inflammation: Manifested by two or more of the following:

1. Temperature > 38.3°C/100.9F or < 36°C/96.8F
2. Heart rate > 90 beats/min
3. Respiratory rate > 20 breaths/min or $PaCO_2$ < 32 mmHg
4. WBC > 12,000 cells/mm^3, < 4000 cells/mm^3, or > 10% bands

Sepsis: The systemic response to an infection.

Severe Sepsis: Sepsis associated with organ dysfunction, hypoperfusion, or hypotension. Hypoperfusion and perfusion abnormalities may include, but are not limited to lactic acidosis, oliguria, or an acute alteration in mental status.

Septic Shock: Sepsis with hypotension, despite adequate fluid resuscitation, along with the presence of perfusion abnormalities that may include, but are not limited to lactic acidosis, oliguria, or an acute alteration in mental status. Patients who are on inotropic or vasopressor agents may not be hypotensive at the time that perfusion abnormalities are measured.

Hypotension: A systolic BP < 90 mmHg or a reduction of > 40 mmHg from baseline in the absence of other causes for hypotension.

PATIENTS WHO WILL BENEFIT FROM EARLY GOAL DIRECTED THERAPY[3]:

1. Two of four signs of inflammation
   AND
2. Suspected or confirmed infection
   AND
3. Systolic blood pressure < 90 mmHg after a 20 ml/kg fluid bolus (septic shock) OR
   Lactate ≥ 4 mmol/L (severe sepsis with high risk) OR
   Evidence of ≥ 1 organ dysfunction (severe sepsis)

Exclusion: age < 18 yrs, pregnancy, stroke, acute coronary syndrome, acute pulmonary edema, status asthmaticus, active GI hemorrhage, seizure, drug overdose, burn, trauma, emergent surgery, uncured cancer, immunosuppression, do-not-resuscitate order

LABORATORY DATA OBTAINED WITHIN ONE HOUR AFTER EMERGENCY DEPARTMENT ARRIVAL:

1. Baseline
    a. CBC with differential, biochemistry, PT/PTT, D-Dimer, Troponin I, urine analysis, type & screen
    b. CXR, ECG
    c. Urine culture, blood culture, sputum culture
2. Baseline and every 3 hours
    a. ScvO2 (central venous blood gas if using intermittent measurements)
    b. Lactate (grey-top tube on ice)

HEMODYNAMIC MONITORING WITHIN 2 HOURS AFTER EMERGENCY DEPARTMENT ARRIVAL:

1. Cardiac monitoring
2. Pulse oximetry
3. Central venous pressure (CVP) monitoring with intermittent ScvO2 measurements[4]
    a. Central venous catheterization via internal jugular or subclavian vein method
4. OR (Preferred) Continuous central venous oxygen saturation (ScvO2) monitoring[5]
    a. ScvO2 catheterization via internal jugular or subclavian vein method
5. Intra-arterial catheterization (optional)

TREATMENT PROTOCOL (FROM 2 HOURS UNTIL ICU ADMISSION):

1. Initiate mechanical ventilation when indicated
2. Give appropriate antimicrobial agent(s) within 4 hours
3. Central venous pressure (CVP) - Preload
    a. CVP < 8 mmHg
        i. 500 mL bolus of normal saline every 30 minutes until CVP reaches 8-12 mmHg, then continue at 150 mL/hr
        ii. Consider lactate ringer instead of normal saline if hyperchloremic acidosis is present
        iii. Consider adding colloid to crystalloid if CVP < 4 mmHg[6]
    b. CVP > 15 mmHg and MAP > 110 (or SBP > 160) mmHg
        i. Initiate nitroglycerin 10-60 mcg/min until CVP < 12 mmHg or MAP < 90 (or SBP < 140) mmHg[7, 8]
4. Mean arterial pressure (MAP) - Afterload
    a. MAP < 65 (or SBP < 90) mmHg after 2 liters of crystalloid
        i. Initiate vasopressors in the order below until MAP > 65 (or SBP > 90) mmHg[4, 9]
            1. Norepinephrine 2-20 mcg/min (first line therapy in sepsis)
            2. Dopamine 5-20 mcg/kg/min
            3. Phenylephrine 40-200 mcg/min (preferred if HR > 120 bpm)
            4. Vasopressin 0.01-0.04 U/min[10-12] (if on another vasopressor)
            5. Epinephrine 2-10 mcg/min (may increase lactate)
        ii. Consider adrenal insufficiency if vasopressor dependent[13]
            1. Give Dexamethasone 2 mg IV (equivalent of Hydrocortisone 50 mg IV) q 6 hrs
            2. Perform cosyntropin stimulation test
                a. Measure baseline cortisol level
                b. Administer ACTH (Cosyntropin/Cortrosyn) 250 mcg IV
                c. Measure cortisol level at 30 min and 60 min after given ACTH
                    i. Change in cortisol $\leq$ 9 ug/dl suggests relative adrenal insufficiency[14]
    b. MAP > 110 (or SBP > 160) mmHg[7, 8]
        i. Initiate nitroglycerin 10-60 mcg/min until MAP < 90 (or SBP < 140) mmHg
        ii. Consider hydralazine 10-40 mg IV

5. Central venous oxygen saturation (ScvO2)[3, 5] – Contractility and oxygen content
    a. ScvO2 < 70% after above therapy and Hb < 10 g/dL
        i. Transfuse 1-2 units packed red blood cells
    b. ScvO2 < 70% after above therapy and Hb ≥ 10 g/dL
        i. Dobutamine 2.5–20 mcg/kg/min titrated until ScvO2 ≥ 70% OR MAP < 70 (or SBP < 100) mmHg OR heart rate > 100 bpm
            1. Caution with starting Dobutamine when MAP < 70 (or SBP < 100 mmHg) OR heart rate > 100 bpm
        ii. Dopamine 5-10 mcg/kg/min
    c. Consider intubation and mechanical ventilation to decrease respiratory muscle oxygen consumption
6. Heart rate:
    a. Heart rate > 120 bpm
        i. Consider digoxin 0.25-0.5 mg IV (possible benefit as inotrope and in controlling heart rate in sepsis with underlying cardiomyopathy)[15]
7. Obtain intensive care consult for admission after above goals are met
8. Go back to each step above until patient is transferred to intensive care unit

THERAPEUTIC GOALS TO BE ACHIEVED WITHIN 6 HOURS, AND MAINTAINED UNTIL AND AFTER ICU ADMISSION[4, 9, 16]:

1. Mechanical ventilation with low tidal volume if indicated
    a. Decreases absolute mortality by 9 percent[17]
2. Hemodynamic monitoring established (within 2 hours)
3. Appropriate broad-spectrum antibiotics administered
    a. Given within 4 hours decreases length of stay by 2 days, and decreases absolute mortality by 24 percent[18-21]
4. Early goal directed therapy goals
    a. Achieved within 6 hours decreases absolute mortality by 16 percent[3]
    b. Central venous pressure 8-12 mmHg
    b. Mean arterial pressure 65 to 90 OR systolic blood pressure 90 to 140 mmHg
    c. Central venous oxygen saturation (ScvO2) ≥ 70%
    d. Urine output > 0.5 ml/kg/hr
6. Decreased lactic acidosis
    a. Lactate clearance (or decrease) of ≥ 10% after 6 hours of resuscitation in the emergency department is associated with improved outcome[22]
    b. Lactate ≥ 4 mmol/L in non-hypotensive patients has 96% specificity of predicting mortality[23]
    c. Lactate normalized to < 2 mmol/L within 24 hours decreases absolute mortality by 25 percent[24, 25]
7. Administer steroid if on chronic steroid, vasopressor dependent, or suspect adrenal insufficiency
    a. Decreases absolute mortality by 10 percent[13]
8. Initiate insulin if required to maintain glucose 80-110 mg/dl
    a. Decreases absolute mortality by 3 percent at 12 months[26]
9. Consider drotrecogin alfa activated/Xigris (recombinant human activated protein C)
    a. Decreases absolute mortality by 13 percent in patients with APACHE II score > 25[27]
    b. ENHANCE Study suggests that Xigris given on day 1 compared to day 2 (or after) is associated with a decreased absolute mortality by 8 percent (unpublished data)

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ADULT SEPSIS CHECKLIST
Version 7.0

CRITERIA FOR EARLY GOAL DIRECTED THERAPY IN SEVERE SEPSIS AND SEPTIC SHOCK

1) Two or more signs of inflammation:
   a) Temperature >38.3°C (100.9F) or <36°C (96.8F)
   b) Heart rate >90 beats/min
   c) Respiratory rate >20 breaths/min or $PaCO_2$ <32 mmHg
   d) WBC > 12,000 cells/mm^3, <4000 cells/mm^3, or >10% bands

2) Suspected or confirmed infection

3) Systolic blood pressure < 90 mmHg after fluid bolus (**septic shock**) OR
   Lactate ≥ 4 mmol/L (**severe sepsis with high risk**) OR
   Evidence of ≥ 1 organ dysfunction (**severe sepsis**)

LABORATORIES AND PROCEDURES (within 2 hours after Criteria)

1) Peripheral IV, cardiac monitor, oxygen, pulse oximetry

2) Obtain **Sepsis panel** (Blood culture, sputum culture, urine culture, urine analysis, CBC w/diff, chemistries, PT/PTT, D-Dimer, Troponin I, Lactate)

3) Calibrate and initiate **CVP and ScvO2 monitoring** after CXR verification of line placement

4) Obtain central venous blood gas from central line

5) Repeat lactate at 6 hours after 1st draw

THERAPY (within 6 hours after Criteria)

1) Broad Spectrum Antibiotics within 4 hours

2) Normal saline 500 mL bolus until CVP 8-12 mmHg, then continue at 150 ml/hr

3) Intervention is required if:
   a) Pulse Ox < 93% (Consider intubation)
   b) Lactate > 2 mmol/L (Repeat lactate in 6 hours)
   c) CVP > 15 mmHg (Consider nitroglycerin)
   d) SBP < 90 mmHg (MAP < 65 mmHg) after 2 Liters IVF (Consider vasopressor)
   e) SBP > 160 mmHg (MAP > 110 mmHg) (Consider afterload reducer)
   f) ScvO2 < 70% (Consider dobutamine and/or transfusion if hemoglobin < 10 g/dL)

4) Target hemodynamic goals by 6 hours and maintained until ICU transfer:
   a) CVP ≥ 8 mmHg
   b) MAP ≥ 65 mmHg / SBP ≥ 90 mmHg
   c) ScvO2 ≥ 70%

5) If patient is on vasopressor and/or APACHE II score ≥ 25, consider:
   a) Corticosteroid and perform Cosyntropin Stimulation Test
   b) Activated Protein C (Drotrecogin alfa activated)

Adult Sepsis Orders

√	**Attending Physician:**
	Diagnosis: □ **Severe Sepsis** □ **Septic Shock**
	Condition: Critical

	Routine Emergency Department Orders
	Cardiac Monitoring & Continuous Pulse Oximetry
	Vitals q 1 hr with Progress Note Documentation by Nurse or MD
	Activity: Bed Rest
	Diet: NPO
	IV Saline lock with flush of Normal Saline 3 mL q 12 hours
	Calibrate & Initiate Central Venous Pressure and $ScvO_2$ Monitoring after line placement verified by MD
	Alert MD if Central Venous Pressure is < 8 mmHg or > 15 mmHg
	Alert MD if Systolic Blood Pressure < 90 mmHg or > 160 mmHg
	Alert MD if $ScvO_2$ < 70%
	Alert MD if Hemoglobin (or Hemacue) < 9 g/dL
	Alert MD if Lactate > 2 mmol/L

	Diagnostics
	Blood culture & sensitivity, urine culture & sensitivity, sputum culture & sensitivity, urinalysis, CBC with differential, comprehensive metabolic panel, Trop I, D-Dimer, PT/PTT/INR
	Lactate level (drawn in grey tube on ice) now and repeat in 6 hours
	Venous blood gas from central line & arterial blood gas
	Chest X-ray - Reason:

	Medications (Check or circle one or more as needed. Date and time must be entered for each order)		
	Physician Signature	**Date and Time**	**ALLERGIES:**
			Intravenous fluids - NS 500 mL IV bolus until Central Venous Pressure 8 to 12 mmHg, then continue NS to run at 150 mL/hour
			Antibiotics - See Parenteral Antibiotic Order Form
			1)
			2)
			3)
			Vasopressors - (SBP = Systolic Blood Pressure)
			Norepinephrine 8 mg/D_5W 250 mL at 2-20 mcg/min., titrate to SBP > 90 mmHg
			Dopamine 800 mg/D_5W 250 mL at 5-20 mcg/kg/min., titrate to SBP > 90 mmHg
			Phenylephrine 10 mg/NS 250 mL at 40-200 mcg/min., titrate to SBP > 90 mmHg
			Vasopressin 20 units/NS 100 mL at 0.01-0.04 units/min., titrate to SBP > 90 mmHg
			Epinephrine 1 mg/NS 250 mL at 2-10 mcg/min., titrate to SBP > 90 mmHg
			Dobutamine 500 mg/NS 250 mL at 2.5-20 mcg/kg/min., titrate to $ScvO_2$ > 70%, maintaining SBP > 90 mmHg and Heart Rate < 140 per min
			Nitroglycerin 100 mg/D_5W 250 mL at 10-60 mcg/min., titrate to SBP < 140 mmHg
			Type & Cross 2 units
			Transfuse ___ unit PRBC - See Blood Transfusion Order Form
			Dexamethasone 2 mg IV q 6 hr
			Xigris (Drotrecogin alfa activated) - See Separate Medication Order Form
	Physician Signature		**Date and Time**

MEDICATION ORDER FORM
Xigris (Drotrecogin alfa activated) for Adult Patients with Severe Sepsis or Septic Shock

INDICATIONS (Circle "Yes" or "No" for each of the following below):

NOTE: Patient must have all three indications to receive Xigris (drotrecogin alfa activated)

1. Yes / No - **Patient has high risk for mortality due to severe sepsis or septic shock defined as:**
   a. (2) and (3) below **AND**
   b. Cardiovascular dysfunction: Arterial systolic blood pressure < 90 mmHg or the mean arterial pressure < 70 mmHg despite adequate fluid resuscitation, requiring the use of vasopressor **AND**
   c. Multi-organ dysfunction as defined by APACHE II Score ≥ 25
2. Yes / No - **Patient has known or suspected infection defined as:**
   a. Presence of white cells in a normally sterile body fluid **OR**
   b. Positive culture (urine, blood, sputum) **OR**
   c. Perforated viscous **OR**
   d. Radiographic evidence of pneumonia in association with the production of purulent sputum
3. Yes / No - **Patient has three or more signs of inflammation defined as:**
   a. Temperature > 38.3^{O}C (100.9F) or < 36.0^{O}C (96.8F)
   b. Heart Rate > 90 beats per minute
   c. Respiratory > 20 breaths per minute or $PaCO_2$ < 32 mmHg
   d. WBC > 12,000/mm^3 or < 4,000/mm^3 or > 10% bands

CONTRAINDICATIONS (Circle "Yes" or "No"):

NOTE: Patient **MUST NOT** receive Xigris (drotrecogin alfa activated) if one or more of the absolute contraindications exist

Absolute Contraindications	Relative Contraindications
Yes / No - Active internal bleeding process	Yes / No - Initial platelet counts less than 30,000/mm^3
Yes / No - Less than 3 months post hemorrhagic CVA, intracranial/spinal surgery, head trauma	Yes / No - History of bleeding diatheses (deficiency of protein C, protein S, antithrombin III; activated protein C resistance, anticardiolipin antibody, antiphospholipid antibody, lupus anticoagulant, or homocystinemia)
Yes / No - Any history of intracerebral arteriovenous malformation, cerebral aneurysm, or mass lesion of the central nervous system	Yes / No - Administration of direct thrombin inhibitor, unfractionated heparin ≥ 15 units/kg/hr in past 8 hours, LMWH greater than prophylaxis dose in past 12 hours, warfarin in past 7 days, ASA > 650 mg/day or antiplatelet agents in past 7 days, or INR > 3.0
Yes / No - Less than 12 hours post surgery requiring general or spinal anesthesia	Yes / No - Administration of thrombolytics in past 3 days, glycoprotein inhibitor agents in past 7 days, or any investigational agents known to affect coagulation
Yes / No - Presence of an epidural catheter	Yes / No - GI bleeding within 6 weeks
Yes / No - Trauma considered to increase the risk of life-threatening bleeding	Yes / No - Less than 3 months from ischemic stroke
	Yes / No - Chronic renal failure requiring hemodialysis or peritoneal dialysis
	Yes / No - Portosystemic hypertension, chronic jaundice, cirrhosis, or chronic ascites
	Yes / No - Recently documented (≤ 3months) or highly suspected DVT or PE
	Yes / No - Acute pancreatitis with no evidence of infection
	Yes / No - HIV (CD_4 < 50)
	Yes / No - Recent bone marrow or organ transplantation
	Yes / No - Age < 18 years
	Yes / No - Weight > 135 kilograms
	Yes / No - Pregnancy and/or breast feeding

Allergies: _____ **Patient Weight = _____ kg** **APACHE II Score: _____**

Patient Weight Range (kg)	Dosing: Check [√] dose that applies to patient's weight
27-43	[ ] Xigris 10 mg in NS 100 mL to run at 8 mL/hour for 8 bags total
44-60	[ ] Xigris 15 mg in NS 150 mL to run at 13 mL/hour for 8 bags total
61-78	[ ] Xigris 20 mg in NS 200 mL to run at 17 ml/hour for 8 bags total
79-95	[ ] Xigris 25 mg in NS 250 mL to run at 21 ml/hour for 8 bags total
96-113	[ ] Xigris 30 mg in NS 300 mL to run at 25 ml/hour for 8 bags total
114-130	[ ] Xigris 35 mg in NS 350 mL to run at 29 ml/hour for 8 bags total
131-135	[ ] Xigris 40 mg in NS 400 mL to run at 33 ml/hour for 8 bags total
Attending Physician Signature:	**Date and Time:**

APACHE II Score Calculation

1. Temperature (^oC / F)	Points
≥ 41°C / ≥ 105.8F	4
39-40.9 / 102.1-105.7	3
38.5-38.9 / 101.3-102	1
36-38.4 / 96.8-101.2	0
34-35.9 / 93.1-96.7	1
32-33.9 / 89.5-93	2
30-31.9 / 85.9-89.4	3
≤ 29.9 / ≤ 85.8	4
2. MAP = [(2 * DBP) + SBP] / 3 (mm Hg)	
≥ 160	4
130-159	3
110-129	2
70-109	0
50-69	2
≤ 49	4
3. Heart Rate (beats per min)	
≥ 180	4
140-179	3
110-139	2
70-109	0
55-69	2
40-54	3
≤ 39	4
4. Respiratory Rate (breaths per min)	
≥ 50	4
35-49	3
25-34	1
12-24	0
10-11	1
6-9	2
≤ 5	4
5. Oxygenation	
a. A-a gradient if FiO_2 ≥ 0.5	
≥ 500	4
350-499	3
200-349	2
< 200	0
b. PaO_2 if FiO_2 < 0.5	
> 70	0
61-70	1
55-60	3
< 55	4

6. Arterial pH	Points
≥ 7.70	4
7.60-7.69	3
7.50-7.59	1
7.33-7.49	0
7.25-7.32	2
7.15-7.24	3
< 7.15	4
7. Serum Sodium (mmol/L)	
≥ 180	4
160-179	3
155-159	2
150-154	1
130-149	0
120-129	2
111-119	3
≤ 110	4
8. Serum Potassium (mmol/L)	
≥ 7	4
6-6.9	3
5.5-5.9	1
3.5-5.4	0
3-3.4	1
2.5-2.9	2
< 2.5	4
9. Serum Creatinine (mg/dL)	
≥ 3.5 & acute renal failure	8
2.0-3.4 & acute renal failure	6
1.5-1.9 & acute renal failure	4
≥ 3.5 & chronic renal failure	4
2.0-3.4 & chronic renal failure	3
1.5-1.9 & chronic renal failure	2
0.6-1.4	0
< 0.6	2
10. Hematocrit (%)	
≥ 60	4
50-59.9	2
46-49.9	1
30-45.9	0
20-29.9	2
< 20	4

11. White Blood Count (per mm^3)	Points
≥ 40	4
20-39.9	2
15-19.9	1
3-14.9	0
1-2.9	2
< 1	4
12. Glasgow Coma Scale (GCS)	
Eyes Opening	
Spontaneous	4
To voice	3
To pain	2
Absent	1
Verbal Response	
Converses / Oriented	5
Converses / Disoriented	4
Inappropriate	3
Incomprehensible	2
Absent	1
Motor Response	
Obeys commands	6
Localizes pain	5
Withdraws from pain	4
Decorticate (flexion) rigidity	3
Decerebrate (extension) rigidity	2
Absent	1
GCS Score =	
GCS Points = 15 – GCS Score =	
APS Points (Sum of 12 points above) =	
Age Points	
≥ 75	6
65-74	5
55-64	3
45-54	2
≤ 44	0
Chronic Health Points*	
Yes, Non-operative	5
Yes, Emergency post-operative	5
Yes, Elective post-operative	2
No	0
APACHE II Score = APS Points + Age Points + Chronic Health Points	

NOTE: Points are determined from the worst physiologic variables in the first 24 hours after patient presentation.

***Chronic Health:**

Organ insufficiency or immunocompromised state must have been evident prior to this hospital admission and conform to the following criteria:
LIVER: Biopsy-proven cirrhosis and documented portal hypertension; episodes of past upper GI bleeding attributed to portal hypertension; or prior episodes of hepatic failure/encephalopathy/coma.
CARDIOVASCULAR: New York Heart Association Class IV
RESPIRATORY: Chronic restrictive, obstructive, or vascular disease resulting in severe exercise restriction; i.e. unable to climb stairs or perform household duties, or documented chronic hypoxia, hypercapnia, secondary polycythemia, severe pulmonary hypertension (>40 mm Hg), or respiratory dependency.
RENAL: Receiving chronic dialysis.
IMMUNOCOMPROMISED: Patient has received therapy that suppresses resistance to infection; e.g. immunosuppression, chemotherapy, radiation, long-term or recent high-dose steroids, or has a disease that is sufficiently advanced to suppress resistance to infection; e.g. leukemia, lymphoma, AIDS.

STOP Sepsis Bundle Quality Checklist Version 7.0 Department of Emergency Medicine Loma Linda University	Date: Patient Name: MRN: Age:	Time of Arrival: Time of EGDT Criteria: Outcome (Dead/Live): Sex:

[ ] **Signs of Inflammation:** Manifested by two or more of the following conditions: [ ] Temperature >38.3°C or <36°C (value=) [ ] Heart rate >90 beats/min (value=) [ ] Respiratory rate >20 breaths/min or (value=) $PaCO_2$ <32 mmHg (value=) [ ] WBC > 12,000 cells/mm^3, <4000 cells/mm^3, or >10% bands (value=)	**PATIENT MET CRITERIA FOR EGDT: Y / N** **CRITERIA FOR EARLY GOAL DIRECTED THERAPY (EGDT) in SEVERE SEPSIS and SEPTIC SHOCK:** [ ] Two of four Signs of Inflammation AND [ ] Suspected OR confirmed infection AND [ ] SBP < 90 mmHg after fluid bolus OR Lactate ≥ 4 mmol/L OR evidence of ≥ 1 organ dysfunction
[ ] **Sepsis:** Signs of inflammation & suspected infection+	
[ ] **Severe Sepsis:** Sepsis associated with ≥ 1 organ dysfunction, or hypoperfusion (lactate > 2 mmol/L)	
[ ] **Septic Shock:** Sepsis with hypotension (BP < 90/60), despite a fluid bolus of 20 mL/kg	

+Infection may represent meningitis, pneumonia, uti, cellulitis, line infection, abdominal infection, etc…

Within 2±1 hours of EGDT Criteria	**Time**	**Quality Achieved#**
1) **Initiate CVP and/or ScvO2 monitoring** □ Central line placed □ CVP monitoring □ ScvO2 monitoring		Y / N

Within 4±1 hours of EGDT Criteria	**Time**	**Quality Achieved#**
2) **Give broad spectrum antibiotic(s)**		Y / N

Within 6±1 hours of EGDT Criteria and/or at ICU adm		**Time**	**Quality Achieved#**
3) **Achieve and maintain EGDT goals (all three goals below)**			Y / N
□ CVP ≥ 8 mmHg	Y / N		
□ MAP ≥ 65 mmHg or SBP ≥ 90 mmHg	Y / N		
□ ScvO2 ≥ 70%	Y / N		

Prior to ICU Adm		**Quality Achieved#**
4) **Resolve global tissue hypoxia** (Lactate ≤ 2.0 mmol/L or decreasing lactate within 12 hrs if Lactate > 2.0 mmol/L)	1st LA: 2nd LA:	Y / N
5) **Dexamethasone (or Prednisone or Hydrocortisone) given** (Not required if not on vasopressor, or not suspect adrenal insuff)	Vasopressor: Y / N Steroid given: Y / N	Y / N

STOP Sepsis Bundle Quality Achieved: Y / N

[ ] Bundle Quality was NOT targeted because of clinician judgment (noted in the chart)

NOTE: Bundle quality is achieved if bundle components (1), (2), and (3) are achieved AND ONE or more of bundle components (4) and (5) are achieved

TOTAL LENGTH OF STAY IN THE EMERGENCY DEPARTMENT _____ (hrs)
TOTAL LENGTH OF HOSPITAL STAY _____ (days)

#If not performed or not obtainable in chart, quality is not achieved

Sepsis Quality Indicators in the ED

for the STOP Sepsis Bundle: Strategies to Timely Obviate the Progression of Sepsis

H. Bryant Nguyen, MD

Version 7.0

General Inclusions: Severe sepsis or septic shock diagnosed in the ED.

General Exclusions: Patients with age < 18 yrs, pregnancy, stroke, acute coronary syndrome, acute pulmonary edema, status asthmaticus, active GI hemorrhage, seizure, drug overdose, burn, trauma, emergent surgery, uncured cancer, immunosuppression, do-not-resuscitate order.

Quality Indicator	Definition of Indicator	Specifications
Hemodynamic monitoring within 2 hours of ED diagnosis	The percent of patients with severe sepsis or septic shock who received CVP and ScvO2 (if available) monitoring within 2 hours of ED diagnosis of severe sepsis or septic shock	*Numerator*: Number of patients who received CVP and ScvO2 (if available) monitoring within 2 hours of ED diagnosis of severe sepsis or septic shock. *Denominator*: Total number of patients with severe sepsis or septic shock diagnosed in the ED. *Exclusion:* Patients who refused invasive procedure or who have significant bleeding risk.

Ref: Shoemaker WC, Wo CC, Yu S, et al. Invasive and noninvasive haemodynamic monitoring of acutely ill sepsis and septic shock patients in the emergency department. Eur J Emerg Med 2000; 7:169-75.
Practice parameters for hemodynamic support of sepsis in adult patients in sepsis. Task Force of the American College of Critical Care Medicine, Society of Critical Care Medicine. Crit Care Med 1999; 27:639-60.

Quality Indicator	Definition of Indicator	Specifications
Broad spectrum antibiotic(s) within 4 hours of ED diagnosis	The percent of patients with severe sepsis or septic shock who received broad spectrum antibiotic(s) within 4 hours of ED diagnosis of severe sepsis or septic shock	*Numerator*: Number of patients who received broad spectrum antibiotic(s) within 4 hours of ED diagnosis of severe sepsis or septic shock. *Denominator*: Total number of patients with severe sepsis or septic shock diagnosed in the ED. *Exclusion:* Patients who refused antibiotic treatment or are allergic to selected antibiotic(s).

Ref: Battleman DS, Callahan M, Thaler HT. Rapid antibiotic delivery and appropriate antibiotic selection reduce length of hospital stay of patients with community-acquired pneumonia: link between quality of care and resource utilization. Arch Intern Med 2002; 162:682-8.
Kollef MH, et al. Inadequate antimicrobial treatment of infections: a risk factor for hospital mortality among critically ill patients. Chest 1999; 115:462-74.

Quality Indicator	Definition of Indicator	Specifications
Early goal directed therapy within 6 hours of ED diagnosis	The percent of patients with severe sepsis or septic shock achieving EGDT goals of CVP 8-12 mmHg, MAP 65-90 mmHg, ScvO2 $\geq$ 70 percent, and urine output > 0.5 ml/kg/hr within 6 hours of ED diagnosis of severe sepsis or septic shock	*Numerator*: Number of patients who received early goal directed therapy and achieved goals within 6 hours of ED diagnosis of severe sepsis or septic shock. *Denominator*: Total number of patients with severe sepsis or septic shock diagnosed in the ED. *Exclusion:* Patients with age < 18 yrs, pregnancy, stroke, acute coronary syndrome, acute pulmonary edema, status asthmaticus, active GI hemorrhage, seizure, drug overdose, burn, trauma, emergent surgery, uncured cancer, immunosuppression, do-not-resuscitate order.

Ref: Rivers E, Nguyen B, Havstad S, et al. Early goal-directed therapy in the treatment of severe sepsis and septic shock. N Engl J Med 2001; 345:1368-77.

Quality Indicator	Definition of Indicator	Specifications
Lactate $\leq$ 2.0 mmol/L or decreasing lactate within 12 hours of ED diagnosis	The percent of patients with severe sepsis or septic shock with lactate $\leq$ 2.0 mmol/L or decreasing lactate within 12 hours of ED diagnosis of severe sepsis or septic shock	*Numerator*: Number of patients who have lactate $\leq$ 2.0 mmol/L or decreasing lactate within 12 hours of ED diagnosis of severe sepsis or septic shock. *Denominator*: Total number of patients with severe sepsis or septic shock diagnosed in the ED. *Exclusion:* Patients who refused blood draw.

Ref: Abramson D, Scalea TM, Hitchcock R, et al. Lactate clearance and survival following injury. J Trauma 1993; 35:584-8; discussion 588-9.
Bakker J, Gris P, Coffernils M, et al. Serial blood lactate levels can predict the development of multiple organ failure following septic shock. Am J Surg 1996; 171:221-6.
Vincent JL, Dufaye P, Berre J, et al. Serial lactate determinations during circulatory shock. Crit Care Med 1983; 11:449-51.
Nguyen HB, Rivers EP, Knoblich B, et al. Early lactate clearance is associated with improved outcome in severe sepsis and septic shock. Crit Care Med 2004; 32:1637-42

Quality Indicator	Definition of Indicator	Specifications
Steroid received if on chronic steroid, vasopressor dependent, or suspect adrenal insufficiency	The percent of patients with septic shock, AND on chronic steroid, vasopressor dependent, or suspected adrenal insuffiency who received steroid in the ED	*Numerator*: Number of patients with septic shock, AND on chronic steroid, vasopressor dependent, or suspected adrenal insuffiency who received Dexamethasone 2 mg IV in the ED *Denominator*: Total number of patients with septic shock diagnosed in the ED, AND on chronic steroid, vasopressor dependent, or suspected adrenal insufficiency *Exclusion:* Patients who received steroid within the last 24 hours.

Ref: Annane D, et al. Effect of treatment with low doses of hydrocortisone and fludrocortisone on mortality in patients with septic shock. JAMA 2002; 288(7):862-71.